

REMARKS

Reconsideration of this application is respectfully requested in view of the foregoing amendment and the following remarks.

Claims 1-7, 9 and 11 were pending in this application. Claims 6-8 and 10-11 have been cancelled, claims 12 and 13 have been added and claim 1 has been amended hereby.

Accordingly, claims 1-5, 9 and 12-13 will be pending herein upon entry of this Amendment. No new matter has been entered. For the reasons stated below, Applicant respectfully submits that all claims pending in this application are in condition for allowance.

In the Office Action the claims were rejected under 35 U.S.C. §103(a) as being unpatentable over Aono et al. (5,521,429), in view of Yamaguchi (6,081,029), further in view of Takata et al. (5,977, 613) further in view of Hirata (JP 01128896, further in view of Sanders et al. (5,028,741). To the extent this ground of rejection might still be applied to claims presently pending in this application, it is respectfully traversed.

Amended claim 1, which is the only independent claim, now sets forth a semiconductor device which comprises a semiconductor chip, a first external connection electrode connected to the chip, a second external connection electrode connected to the chip, and a resin package that covers the chip and has a mounting surface. The resin package also includes a first side surface, a second side surface adjacent to the first side surface, a third side surface opposite to the second side surface, and a fourth side surface opposite to the first side surface. Each of the first and second electrodes includes a thick portion and a thin portion. The thick portion is exposed to outside only at the mounting surface of the package. The thick portion is not exposed at the first

to fourth surfaces of the package. The thin portion of the first electrode includes a first extension and a second extension. The first extension is spaced from the mounting surface of the package and exposed at the first side surface of the package. The second extension is spaced from the mounting surface and the first side surface of the package while extending toward the second electrode. The thin portion of the second electrode is spaced from the mounting surface of the package and exposed at the fourth side surface of the package.

The technical significance of the present invention defined in amended claim 1 is fully described in Paragraphs 0045 and 0046 (pages 11 and 12) of the specification. Briefly speaking, if the thick portion is exposed not only at the mounting surface (bottom surface in the embodiment) but also at any one of the side surfaces of the resin package (as shown in Fig. 8), a deposit of bonding solder 60 inevitably flows on the side surface 3a (or 20a') due to surface tension and bulges laterally for merging with a solder deposit for a nearby packaged semiconductor device, consequently making it difficult to mount a plurality of semiconductor chips at a high density. The present invention solves this problem by making the thick portion to be exposed only at the mounting surface of the resin package, as clearly shown in Figs. 1 and 4.

Due to the provision of the first extension, the thick portion of the first external connection electrode can be spaced from the first side surface of the resin package. Due to the provision of the second extension, the thick portion of the first external connection electrode can be sufficiently spaced from the thick portion of the second electrode, thereby preventing a solder deposit for the first external connection electrode from merging with another deposit for the second external connection electrode. Thus, the present invention prevents electrical shorting

not only between two adjacent semiconductor devices but also between different electrodes of a single semiconductor device even if the size of the semiconductor device is greatly reduced for enabling high density mounting of multiple semiconductor devices.

As pointed out by the Examiner, US Patent No. 5,521,429 to Aono et al. discloses a plurality of electrodes 12 (leads) each of which has a thick portion 16 and a thin portion 17. However, it is the essential feature of Aono et al. to extend the thick portion 16 laterally out of the resin package 14 for providing a connection terminal (see column 2, lines 19-35). In any disclosed embodiment of Aono et al., each thick portion 16, 22, 36, 46, 58 is extended laterally out of the resin package because this feature is essential. The Examiner's attention should be also drawn to the fact that the extended-out thick portion is a claimed feature for the invention of Aono et al. Therefore, it is against the teaching of Aono et al. to modify their semiconductor device for arriving at the claimed structure of the present invention.

JP-A 1-128896 to Hirata teaches the opposite of Aono et al. Specifically, each lead 3 includes a thin outer portion 3a extending laterally extending out of the resin package 4, and a thick inner portion 5 for mounting an IC chip 1. However, this reference clearly fails to teach an element which corresponds to the claimed second extension (of the thin portion of the first external connection electrode).

The remaining references are clearly less pertinent to the claimed invention than those discussed above, requiring no separate discussion.

Regarding claim 5, it is emphasized that this claim requires the first electrode (not two different electrodes) to include two thick portions connected together by a thin portion. It

appears that the Examiner improperly equates the two thick portions of the two electrodes with the two thick portions of a single electrode.

Finally, new claims 12 and 13 set forth the structural features which are found in Fig. 2 and which are not taught nor suggested by any of the cited references.

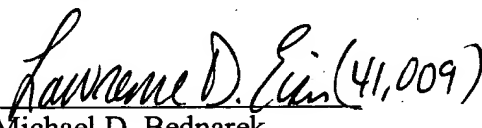
In view of the foregoing all of the claims in this case are believed to be in condition for allowance. Should the Examiner have any questions or determine that any further action is desirable to place this application in even better condition for issue, the Examiner is encouraged to telephone applicant's undersigned representative at the number listed below.

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Respectfully submitted,

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Attachments:

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